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Catch Rates By Index Fishermen In The 4T Herring Fishery, 1986 - 1987

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CONTENTS

ABSTRACT iv

RESUME v

INTRODUCTION 1

METHODS 1

RESULTS AND DISCUSSION 2

- Index fisherman catch rates 2
- Catch rates calculated from quota reports 2
- The relationship between catch rates and wind speed ... 3
- The effect of boat quotas on catch rates 3
- Boat crowding and catch rates 4
- The effect of the week-end closure on catch rates 4

CONCLUSIONS 5

ACKNOWLEDGEMENTS 5

LITERATURE CITED 6

TABLES 6

FIGURES 10

ABSTRACT

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The index fisherman program collects catch rate data from herring gillnet fishermen in NAFO division 4T by means of telephone interviews conducted during the fishing season. Overall mean catch rates for index fishermen were 1.40, 0.264, and 1.34 tonnes·net^{-1}·day^{-1} for fall 1986, spring 1987 and fall 1987, respectively. Differences in mean catch rates between fall 1986 and fall 1987 were not statistically significant. The suggestion that windy conditions depressed catch rates in the Chaleur area in fall 1987 was not supported by data. Vessel quotas and crowding on the fishing grounds may have had a negative effect on catch rates in fall 1987, but the relationship between these factors and catch rates could not be quantified. No evidence was found that catch rates were depressed following week-end fishing closures. The index fisherman program is valuable as a listening post to events and trends in the fishery. Catch rates supplied by index fishermen are probably more reliable that those from the commercial fishery as a whole, but their utility is restricted by small sample sizes.

RESUME

Cairns, D.K., E.M.P. Chadwick, and C. Bourque. 1988. Catch rates by index fishermen in the 4T herring fishery, 1986-1987. Can. Tech. Rep. Fish. Aquat. Sci. No. 1660

Le programme de pêcheurs indices récolte des données relatives au taux de capture du hareng à l'aide d'entrevues téléphoniques avec les pêcheurs utilisant des filets maillants dans la division 4T de l'OPANO. Ces entrevues se font durant la saison de pêche. Les taux moyens de capture étaient 1.40, 0.264, et 1.34 tonnes filet^{-1} jour^{-1} pour l'automne 1986, le printemps 1987, et l'automne 1987 respectivement. Les différences entre les taux moyens de capture pour l'automne 1986 et l'automne 1987 n'étaient pas significatives statistiquement. L'hypothèse que les conditions venteuses durant l'automne de 1987 aient diminué le taux de capture dans la région de la Baie des Chaleurs n'a pas été supportée par les données. Les contingents par bateaux et le rapprochement excessif des bateaux sur les lieux de pêche avaient possiblement eu un effet néfaste sur le taux de capture en automne 1987, mais la relation entre le taux de capture et ces variables n'a pas pu être quantifiée. Il n'y a pas d'évidence que les fermetures durant les fins de semaines ont diminué les taux de captures. Le programme des pêcheurs indices s'avère utile comme poste d'écoute des événements et des tendances dans la pêcherie. Les taux de capture fournis par les pêcheurs indices sont probablement plus fiables que ceux qui proviennent de la pêche commerciale dans son ensemble, mais leur valeur est limitée par la taille restreinte de l'échantillon.

INTRODUCTION

Assessment of herring stocks in the southern Gulf of St. Lawrence (NAFO Division 4T) requires a reliable indicator of trends in stock abundance. Recent assessments have used abundance indices based on gillnet catch rates, estimated from landings data from purchase slips and effort data obtained through telephone surveys (Chadwick and Cairns 1987, Nielsen 1988).

Because of difficulties in interpreting catch rates derived from purchase slips (Chadwick and Cairns 1987), Science Branch of Gulf Region is developing and testing alternate methods of estimating herring abundance trends. These include acoustic surveys (Cairns et al. 1988), spawning bed surveys (Messieh et al. 1987), subjective evaluations by fishermen (Nielsen 1988), and the index fisherman program. In the index fishermen program, catch rates are obtained directly from selected gillnet fishermen through telephone interviews conducted during the fishing season. This paper presents results of the first two years of index fisherman data, and evaluates the program's usefulness as an indicator of herring abundance.

METHODS

The index fisherman program is based on telephone surveys to a sample of gillnet herring fishermen in each of the main fishing areas of 4T (Fig. 1). Numbers of participants in the program are given in Table 1. Fishermen were selected on the basis of recommendations from conservation officers, port samplers, and industry representatives. Participants were furnished with forms (Fig. 2) which they used to record daily catch and effort data. Instructions for completing the forms were given during personal visits by department staff. Effort was measured as number of nets fished per day (spring fishery) or per night (fall fishery). The forms provided space for a breakdown of weight of herring caught into weight dumped, weight sold to plant, and weight used for bait. The forms also had spaces for length of nets, width of nets in number of meshes, mesh size, twine type, and exact location of fishing (Loran C or lat/long).

Program participants were telephoned weekly by a departmental interviewer during the fall fisheries of 1986 and 1987 and during the spring fishery of 1987, and asked to read the information recorded on the forms. If the information could not be provided because the fisherman was not at home or because the form had been left in the boat, repeat calls were made until the data were obtained. During the telephone interviews fishermen were also encouraged to pass on their views regarding the state of the fishery and their interpretation of current trends.

Anovas were used to evaluate catch rate variation in

relation to fisherman, date, and year. Influence of wind speed on catch rate was examined using weather data gathered at the Atmospheric Environment Service recording station on Miscou Island, N.B.

RESULTS AND DISCUSSION

Index fisherman catch rates

Catch rates by index fishermen, in tonnes·net^{-1}·day^{-1}, fluctuated widely within fishing seasons (Figs. 3-6). Overall mean catch rates were 1.40 and 1.34 tonnes·net^{-1}·day^{-1} for the fall 1986 and 1987 fisheries, respectively (Table 2, Fig. 7). Mean catch rates were slightly lower in fall 1987 than fall 1986 in all areas except Fisherman's Bank, but one-way anovas comparing catch rates between years were not statistically significant (Table 2). Catch rate in the spring 1987 fishery was much lower (0.264 tonnes·net^{-1}·day^{-1}) than those of the two fall fisheries.

One-way anovas using date as a treatment effect showed that catch rate varied significantly among dates in all areas except Pictou ($P \leq .025$, Table 2). A similar analysis using fisherman as treatment indicated that catch rates varied significantly among fishermen in the Bay of Chaleur area, but not elsewhere.

Dimensions of gillnets used by index fishermen in 1987 are presented in Table 3. In both spring and fall index fishermen from Chaleur used the longest nets, which may in part account for the higher catch rates recorded there (Fig. 7).

Catch rates calculated from quota reports

Resource Allocation Branch of Gulf Region compiles daily reports of catch and effort (number of boats fishing) during herring gillnetting seasons. These reports allow it to monitor cumulative catches over the season and to order timely season closures. To examine the relationship between catch rates derived from index fishermen and those based on quota reports, we traced daily quota report catch rates for the Chaleur area (Fig. 3), and plotted the relation between catch rates derived by the two methods (Fig. 8). Catch rates based on quota reports showed similar daily fluctuations to those calculated from index fishermen (Fig. 3). Catch rates calculated by the two methods were significantly related ($R^2 = 0.55$, P.0001; Fig. 8). Chaleur catch rates based on quota reports did not differ significantly between fall 1986 and fall 1987 (Table 2).

The relationship between catch rates and wind speed

Because fishermen in the Bay of Chaleur suggested that windy conditions depressed catch rates in the fall of 1987, we examined the relationship between wind speed and herring catch rates (Fig. 9). Although herring were caught at winds up to 25 knots, the plot suggests that catch rates were reduced in windy weather. We therefore calculated catch rates for days in which wind did not exceed 15 knots (Table 2). Catch rates calculated from index fishermen and from quota reports were lower in fall 1987 than in fall 1986 on these days, but differences were not significant. Comparison of the frequency distribution of maximum wind speeds between the two years (Fig. 10) suggests that there was little difference in the wind regimes of the two years, and that any effects of wind would likely be similar between the two years.

The effect of boat quotas on catch rates

In the fall 1987 fishery boat quotas were introduced which limited daily landings to 20,000 lbs. (9.07 tonnes) per vessel in the Bay of Chaleur, Pictou, and Alberton areas, and 15,000 lbs. (6.80 tonnes) per vessel in the Fisherman's Bank area. We evaluated the influence of boat quotas on landings by plotting frequency distributions of catches for each of the four areas for the fall fisheries of 1986 and 1987 (Fig. 11). In each of the four areas, the right tail of the frequency distribution dropped more abruptly in 1987 than in 1986. This suggests that landings might have been higher on some nights if boat quotas had not been imposed.

Nightly catches often exceeded vessel quotas, particularly in the Chaleur and Alberton areas (Fig. 11). These overruns seem to be related to incomplete enforcement of boat quotas, and in certain cases, to the transfer to other boats of fish caught above the quota limit. Dumping did not seem to be a factor in these overruns, as index fishermen reported that virtually all their catch was either sold to plants or transferred to other fishermen.

In theory, boat quotas should not influence catch per unit effort, because fishermen subject to vessel quotas should simply reduce effort to stay within quota restrictions. If quotas restrict catches, catch and effort should thus decline together, and catch rate should be unaffected. However, our effort data consist only of "number of nets fished", and with rare exceptions, we do not know how long each net was in the water or how many times it was fished per night. From personal observations and conversations with numerous fishermen, it is clear that fishermen left their nets in the water for briefer periods in 1987 than in 1986. Anecdotal reports also suggest that they lifted them more frequently in 1987 than 1986. The reason for these changes was to avoid exceeding the vessel quota.

Ideally, the index fisherman program should gather data on soak time. However, fishermen who are setting, hauling, and shaking nets are generally very preoccupied with their work and are unlikely to consistently or accurately record set and lift times. For this reason, and because we do not want to impose on the good will of program participants, we have not included soak time on the index fishermen forms.

Boat crowding and catch rates

Index and other fishermen commonly reported that they found it more difficult to fish in 1987 than in 1986 because of crowding on the grounds. They stated that the large number of boats in 1987 made it difficult to maneuver to locate and set on the schools, and that fishing was frequently interrupted by gear tangles.

Number of boat-nights in the fall herring fishery, based on effort data contained in the daily quota reports, rose from 6347 to 9453 between 1986 and 1987 (Table 4). This is an increase of 49%. In the Bay of Chaleur, modal fishing effort in terms of number of boats was similar in the two years, but peak effort was much higher in 1987 (Fig. 12). The number of active boats in the Chaleur area never exceeded 300 in fall 1986, but this level was surpassed on seven nights in 1987.

The effects of boat crowding on catch rate cannot be readily quantified. Nevertheless the numerous anecdotal reports and the greatly increased effort in 1987 suggest that crowding may have lowered catch rates in that year.

The effect of the week-end fishing closure on catch rates

At consultative meetings between the Department and industry in the winter of 1988, some fishermen expressed the view that the closure of the fishery on Saturday and Sunday depressed catch rates because fishermen would lose track of the location of herring concentrations during the non-fishing period. If every-day fishing is required to maintain knowledge of herring locations, and such knowledge is required to produce high catch rates, then catch rates should decrease over week-ends, when fishing is not permitted. We evaluated this hypothesis by comparing catch rates on Fridays with those of subsequent Mondays in the fall 1987 fishery. In the Chaleur area, index fisherman catch rates rose from Friday to Monday for all five week-ends for which data were available (Fig. 3) Quota report catch rates rose between Friday and Monday on two of three week-ends in the Chaleur area (Fig. 3). Friday-Monday comparisons were also available for four week-ends in Alberton, Pictou, and Fisherman's Bank (Figs. 4 and 5). In three of these week-ends, catch rates

rose between Friday and Monday. We conclude that there is no evidence that the week-end fishing closure depresses catch rates.

CONCLUSIONS

The index fisherman program was established because of error and bias that may occur in purchase slip records of catch, and effort data obtained through annual telephone surveys (Chadwick and Cairns 1988, Nielsen 1988). Table 5 lists advantages and disadvantages of catch rates calculated from index fisherman vs. those obtained from purchase slips and annual telephone surveys. The most important advantages of the index program are the relative reliability of the data obtained, and the immediacy of both data acquisition and fishermens' comments. The major disadvantage of the program resides in its small sample sizes and its substantial staff requirements.

Through the index fisherman program, we have learned of factors which potentially bias catch rates calculated by both methods. One of these potential biases (wind speed) can be readily evaluated and windy days can be eliminated from the analysis if wind is found to be a factor. The other two factors (boat quotas and boat crowding) can be examined quantitatively, but they influence catch rates in complex ways that cannot be readily measured or estimated. The effect of boat quotas on catch rate is likely to be influenced by the strictness of enforcement, which is likely to vary among regions and years.

Our experience with the first two years of the index fisherman program indicates that there is no simple way to obtain unbiased indices of commercial herring catch rates. The immediate utility of the program is that it provides a valuable window to trends and events in the fishery. A full evaluation of the utility of the index fisherman program as an abundance indicator will be possible as a time series of data accumulates.

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This project has been made possible by the cooperation of fishermen who have kept records and given their time to answer our questions. We extend our thanks to Arthur Arsenault, André Doiron, Benoît Doiron, Alcide Haché, Donat Lacroix, Aurel Lanteigne, Adelin Leger, Paul-Aimé Mallet, Frank McLauglin, Dave Vibert, Alvin Doucet, Stuart Beaton, John Andrew Boyd, Percy Haines, David Harding, Cameron McKenzie, Donald King, Danny Kinnear, Dave Murdock, Danny Perry, Barry White, Herb Ashley, Jimmy Fraser, Kenny Fraser, and John Weeks. We are indebted to Winnie Chiasson for helping put us in contact with index fishermen. We also thank Gloria Nielsen and Martina Poirier for their help in entry and analysis of 1986 data, and Rhéal Vienneau

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LITERATURE CITED

Cairns, D.K., J.A. Wright, and E.M.P. Chadwick. 1988. Acoustic backscatter estimates and school behaviour of herring in NAFO Divisions 4T and 4Vn, November 1987. CAFSAC Res. Doc. 88/46.

Chadwick, E.M.P., and D.K. Cairns. 1988. Assessment of Atlantic herring in NAFO Division 4T, 1987. CAFSAC Res. Doc. 88/38.

Messieh, S., P. MacPherson, and C. Bourque. 1987. Herring spawning bed survey in Fisherman's Bank, P.E.I. in fall 1986. CAFSAC Res. Doc. 87/41.

Nielsen, G.A. 1988. The 1987 4T herring gillnet questionnaire. CAFSAC Res. Doc. 88/51.

Table 1. Number of participants in the index fisherman program, 1986 and 1987.

Area	Number of participants		
	1986	1987	
	Fall	Spring	Fall
Bay of Chaleur	5	3	10
Escuminac	0	1	0
Pictou	3	2	4
Fisherman's Bank	3	0	4
Alberton	2	2	4
Total	13	8	22

Table 2. Catch rates in the 4T herring gillnet fishery, 1986 and 1987. Catch rates for index fishermen are derived from telephone interviews with fishermen during the fishing season. Catch rates from quota reports are based on daily estimates of landings and number of active boats made by Resource Allocation Branch. Comparisons of fall catch rates refer to one-way anovas comparing catch rates between years, among dates, and among individual fishermen.

Area	1986			1987						comparisons of fall catch rates					
	fall			spring			fall			year		date		fisherman	
	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	F	P	F	P	F	P
BAY OF CHALEUR															
Index fishermen (tonnes net^{-1} day^{-1})															
all days	1.88	1.50	72	0.409	0.344	36	1.66	1.04	178	1.70	0.19	3.54	0.0001	3.30	0.0005
wind < 16 kt	2.02	1.50	61				1.71	1.10	124	2.53	0.11	3.67	0.0001	3.09	0.0012
Quota reports (tonnes boat^{-1} day^{-1})															
all days	5.30	2.85	24				4.68	2.15	21	0.64	>0.75				
wind < 16kt	5.82	3.13	17				4.89	2.23	16	0.91	>0.75				
ESCUMINAC															
Index fishermen (tonnes net^{-1} day^{-1})				0.119	0.156	18									
PICTOU															
Index fishermen (tonnes net^{-1} day^{-1})	1.26	1.00	32	0.118	0.161	7	0.92	0.59	45	3.48	0.07	1.53	0.10	1.91	0.14
FISHERMAN'S BANK															
Index fishermen (tonnes net^{-1} day^{-1})	0.91	0.42	43				0.94	0.53	62	0.09	0.77	1.95	0.008	0.93	0.45
ALBERTON															
Index fishermen (tonnes net^{-1} day^{-1})	0.99	0.51	21	0.035	0.021	7	0.87	0.31	27	0.96	0.33	2.26	0.025	0.48	0.70
4T															
Index fishermen (tonnes net^{-1} day^{-1})	1.40	1.18	168	0.264	0.308	68	1.34	0.93	312	0.35	0.56	2.63	0.0001	6.00	0.0001

Table 3. Dimensions of gillnets used by index herring fishermen.

Region	Net depth (meshes)					Net length (fathoms)					Mesh size (inches)				
	mean	SD	min	max	net-days	mean	SD	min	max	net-days	mean	SD	min	max	netdays
Spring 1987															
Chaleur	89	21	50	100	36	19.5	3.1	14	22	36	2.378	0.081	2.250	2.500	36
Escuminac	80	0	80	80	18	15.0	0.0	15	15	18	2.250	0.000	2.250	2.250	18
Pictou	77	25	50	100	15	13.5	1.5	12	15	14	2.372	0.132	2.250	2.625	22
Fall 1987															
Chaleur	114	11	100	125	183	20.6	5.0	16	35	178	2.630	0.017	2.625	2.688	183
Alberton	100	0	100	100	27	17.1	4.8	12	25	27	2.625	0.000	2.625	2.625	27
Pictou	98	5	88	100	44	16.4	1.5	15	18	44	2.730	0.046	2.625	2.750	44
Fisherman's Bank	117	24	100	150	62	13.7	3.0	11	20	61	2.625	0.000	2.625	2.625	62

Table 4. Fishing effort in the herring gillnet fishery in District 4T, fall 1986 and 1987.

District	Number of boat-nights	
	1986	1987
Bay of Chaleur	3964	5538
Gulf Nova Scotia	940	
Pictou		1927
Prince Edward Island	1443	
Fisherman's Bank		1725
Western P.E.I. - Escuminac		263
Total	6347	9453

Table 5. Advantages and disadvantages of catch rates calculated from index fisherman program, compared to catch rates based on purchase slips and annual telephone surveys.

Index fisherman program	Catch rates from purchase slips
Advantages	
Index fishermen are more likely to honestly report catch and effort data to the interviewer, because they know him personally through repeated conversations. The Department is able to select participants in the program on the basis of their honesty and reliability.	Catch data in purchase slip files may have been altered to avoid detection of quota overruns, to avoid income tax or to increase unemployment insurance benefits. Fishermen interviewed during telephone gillnet surveys may mis-represent their catch or effort data in the belief that a more favourable report of fish abundance will increase TACs.
Index fishermen bring problems in the fishery and factors that potentially influence catch rates to the attention of the Department while the fishery is ongoing.	Fishermen interviewed in the gillnet questionnaire are less able to give exact information on the fishery because their interviews are conducted after the fishing season is over.
Although only a small number of fishermen directly participate in the index fisherman program, the program provides considerable benefit in improving relations between the Department and fishermen, because index fishermen are often well known and well respected in their communities. Contacts with index fishermen may facilitate the development of other collaborative ventures.	Interviews conducted during the gillnet telephone surveys are "one-time" events, and likely have little influence on the Department's relationship with fishermen.
Disadvantages	
Given current staff time available (several person-weeks in the spring and the fall), data can be gathered from only ca. 20-30 fishermen. Small sample sizes broaden the confidence limits of catch rates calculated from index data.	Purchase slip data are assembled from all gillnetters in 4T, and telephone gillnet surveys reach a large number (ca. 400) of fishermen. The total sample size is very large.
In order to maintain good relations and credibility with index fishermen, it is necessary that interviews be conducted by a person who is thoroughly familiar with the herring fishery. In practice, this means that a considerable amount of technician time must be devoted to the program.	Purchase slip data are gathered by Statistics Branch. Gillnet telephone surveys are conducted by contractors whose time is less costly than that of Department technicians.

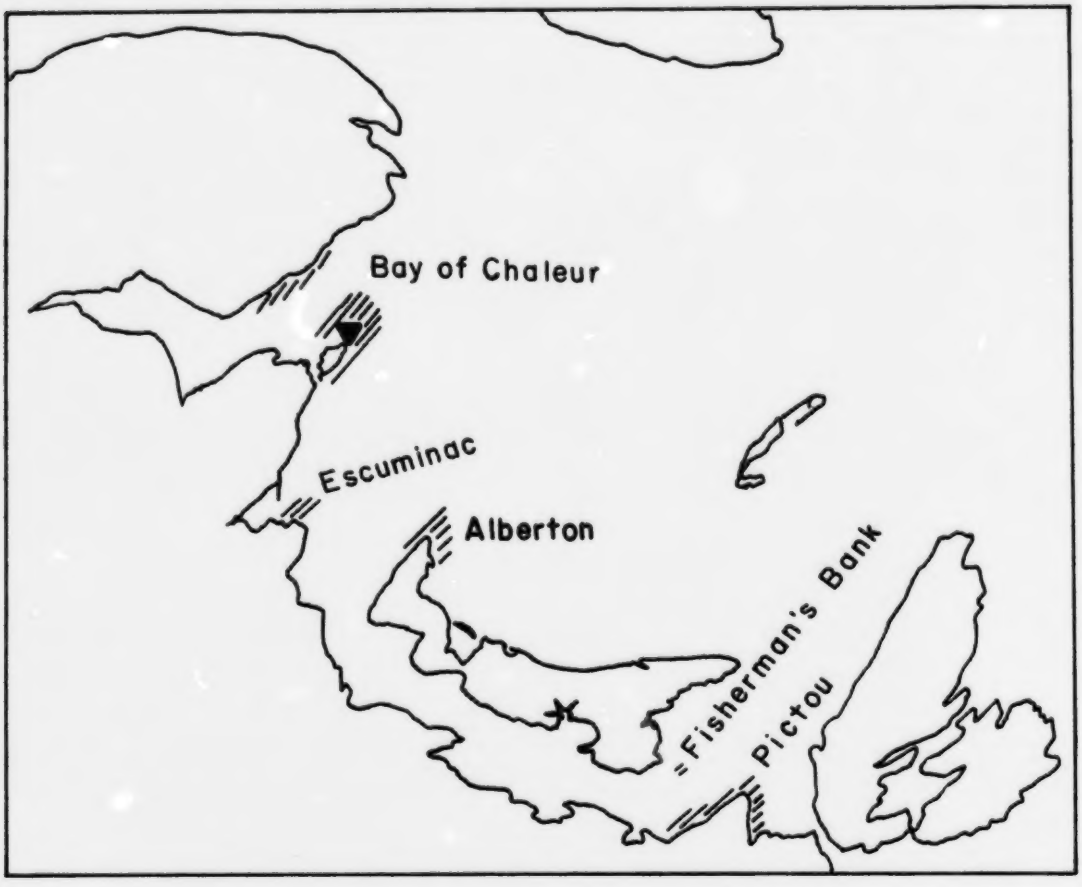

Fig. 1 The southern Gulf of St. Lawrence, showing herring fishing areas used by index fishermen. The solid triangle gives the location of the Miscou Island weather station.

HERRING GILLNET FISHERMAN'S LOG

Fisherman's Name: _____
Week Ending (Sunday) date: _____
Name of Area Fished: _____
Depth of Nets Used (Meshes): _____
Length of Nets Used (Fathoms: _____
Type of Net (Twine Type): _____
Mesh Size: _____

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Weight Caught							
Weight Dumped							
Weight Sold (to fish plants)							
Weight Sold For Bait (or personal use)							
Number of Fish Kept For Sample							
Number of Nets Fished							
Location (Loran C or Lat. Long)							
Comments and Remarks (tear-ups, weather, nets lifted by other boats, etc.) (Continue on back)							

Fig. 2 Form used by fishermen to record catch and other data.

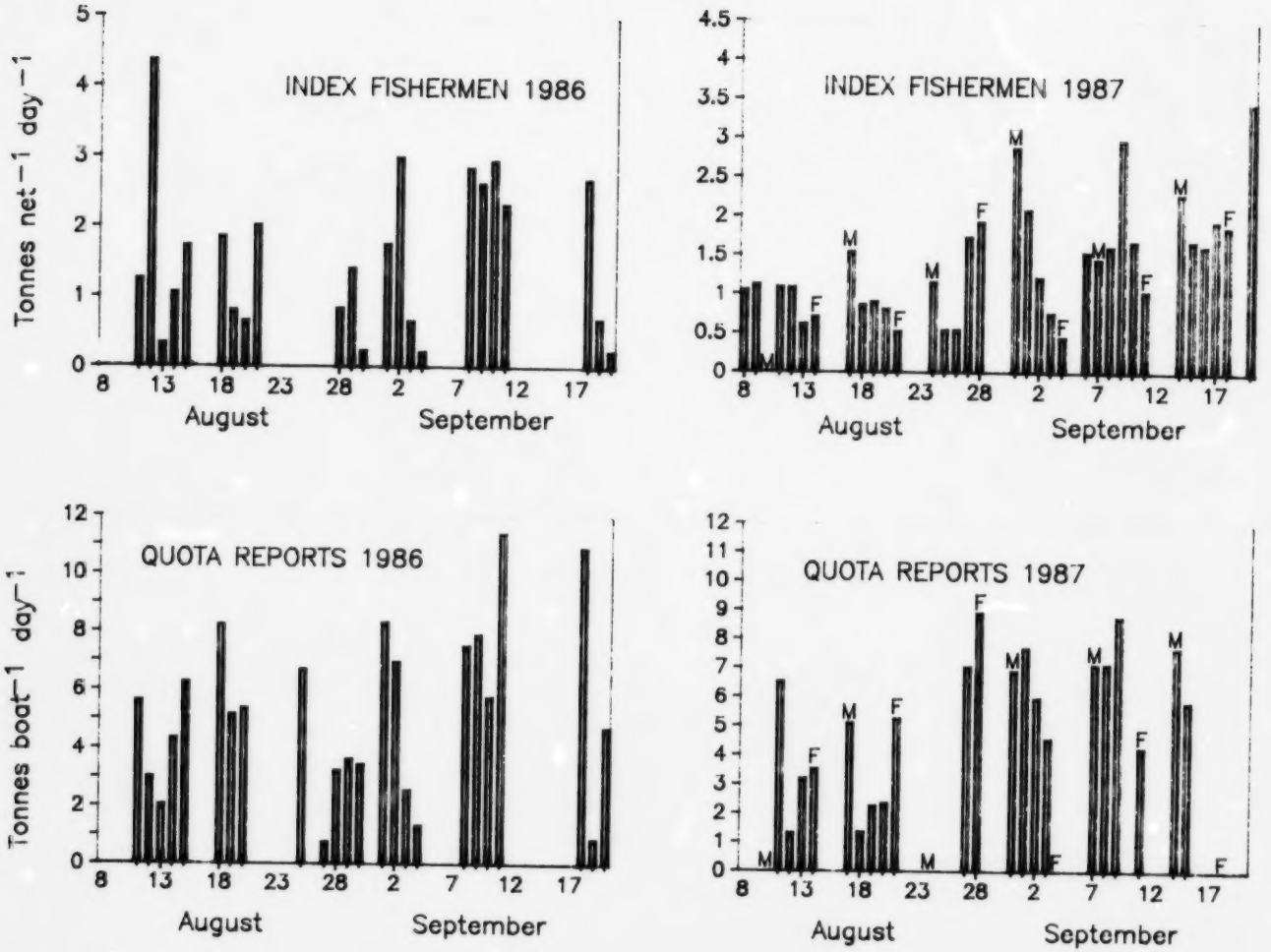

Fig. 3 Mean daily catch rates of herring fishermen in the Bay of Chaleur area, fall 1986 and 1987. The upper panels show catch rates of index fishermen. The lower panels show catch rates calculated from quota monitoring reports by fishery officers. No data available on days where tick marks are absent. F means Friday, M means Monday.

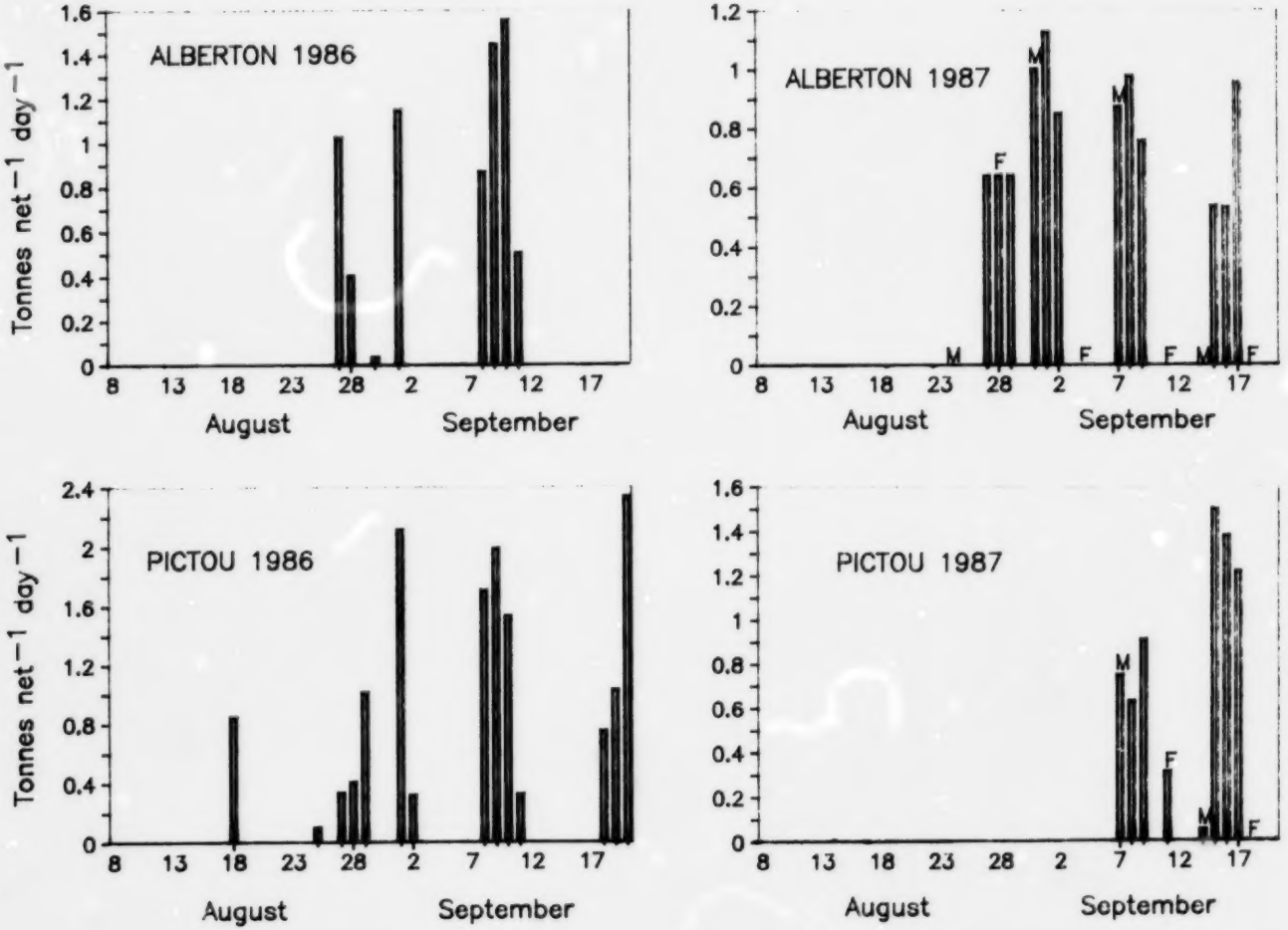

Fig. 4 Mean daily catch rates of index herring fishermen in the Alberton and Pictou areas, fall 1986 and 1987. No data available on days where tick marks are absent. F means Friday, M means Monday.

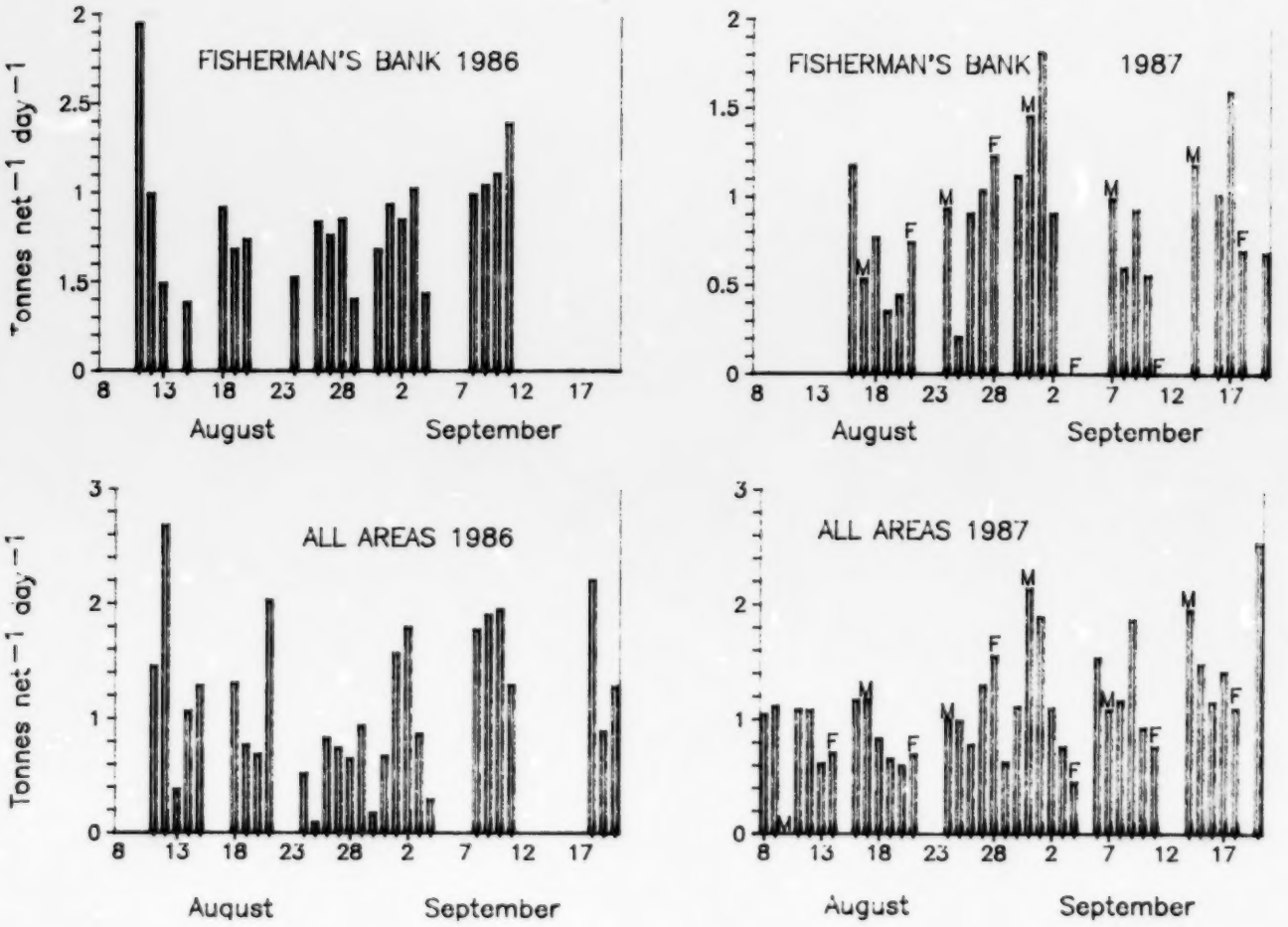

Fig. 5 Mean daily catch rates of index herring fishermen in the Fisherman's Bank area and in all areas of the southern Gulf of St. Lawrence in fall 1986 and 1987. No data available on days where tick marks are absent. F means Friday, M means Monday.

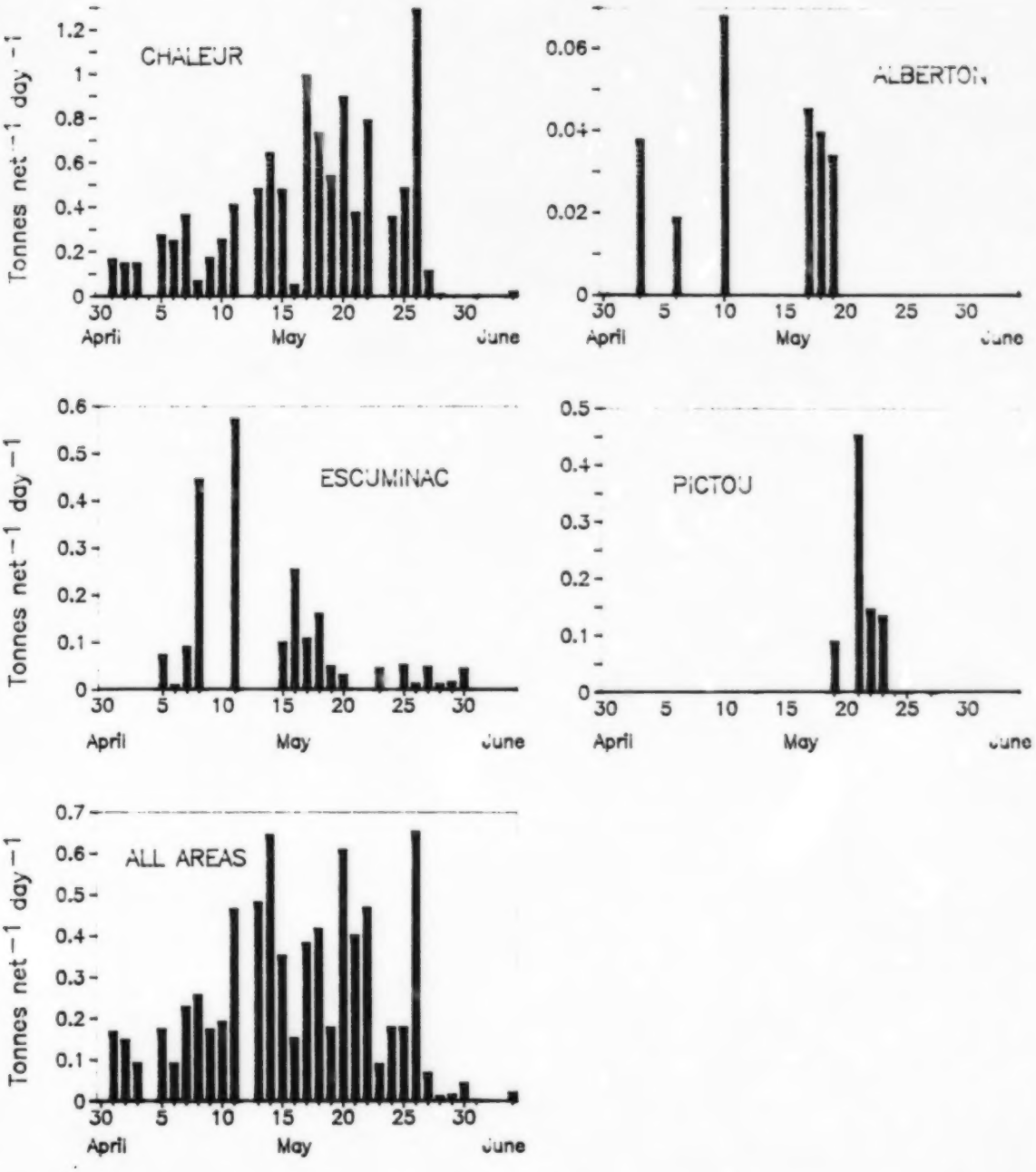

Fig. 6 **Mean daily catch rates of index herring fishermen in the southern Gulf of St. Lawrence, spring 1987. No data available on days where tick marks are absent.**

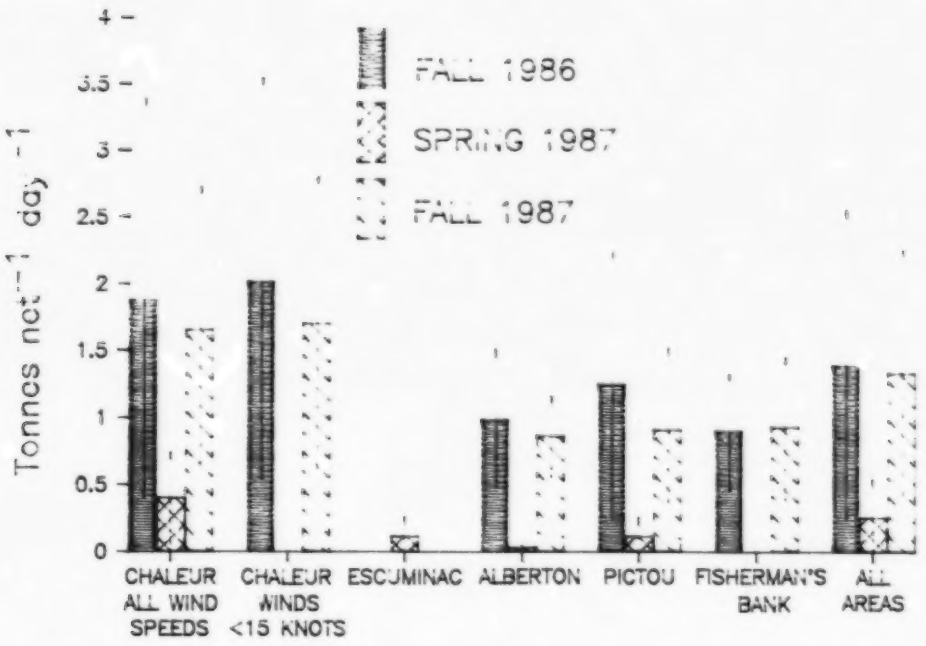

Fig. 7 Mean catch rates of herring gillnetters in the index fisherman program in the southern Gulf of St. Lawrence, 1986 and 1987. Vertical bars indicate ± one standard deviation.

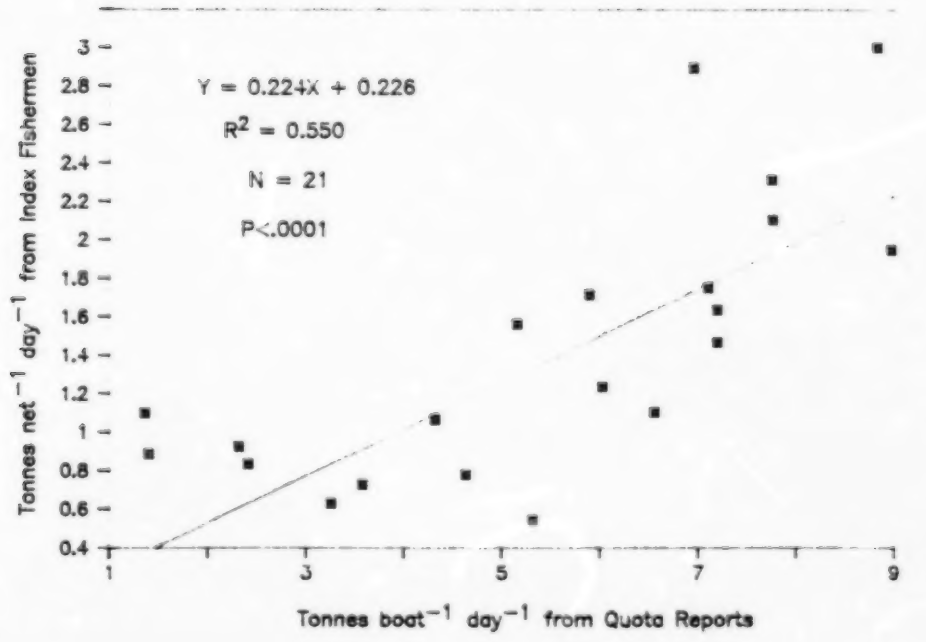

Fig. 8 Relation between catch rates calculated from daily quota reports and catch rates of index fishermen in the Bay of Chaleur area, fall 1987.

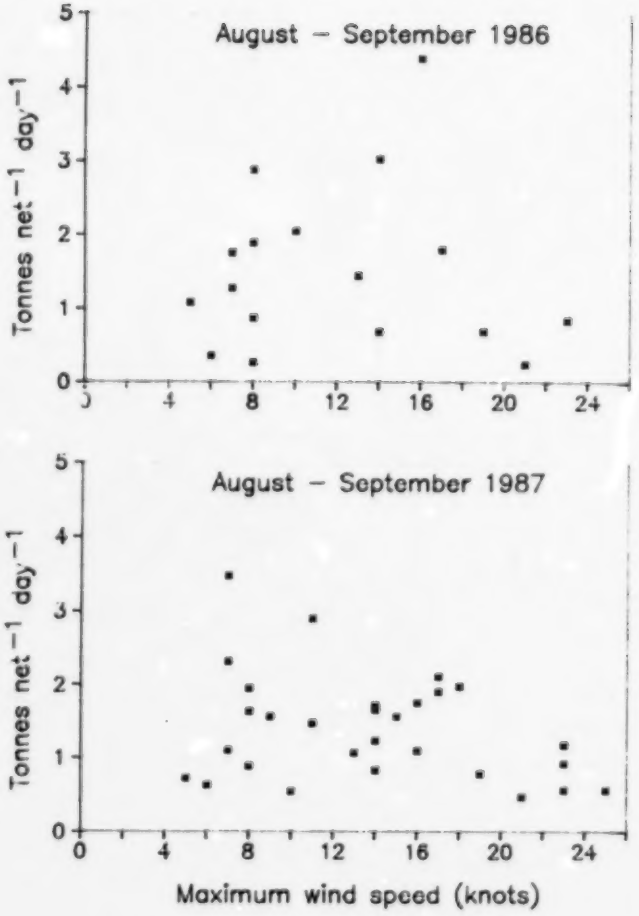

Fig. 9 Relationship between herring catch rates of index fishermen and maximum wind speed for the Bay of Chaleur area, fall 1986 and 1987. Each square represents one night of fishing. Maximum wind speed refers to the mean wind speed of the windiest 10 min period prior to the top of each hour between 1800 and 0600, as recorded by the Environment Canada weather station on Miscou Island.

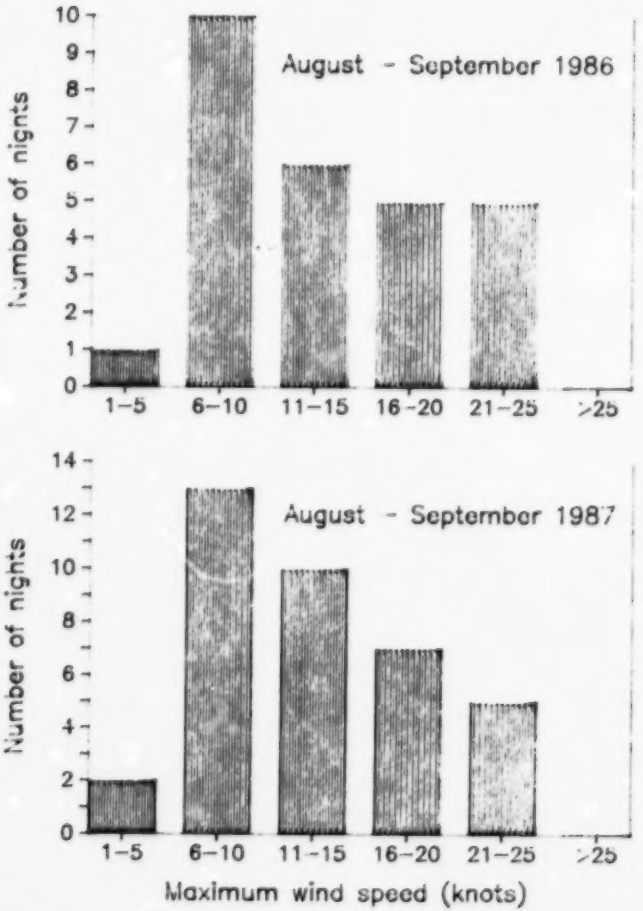

Fig. 10 Frequency distribution of maximum nightly wind speeds recorded between 1800 and 0600 at the Miscou Island weather station during the herring fishing seasons, fall 1986 and fall 1987.

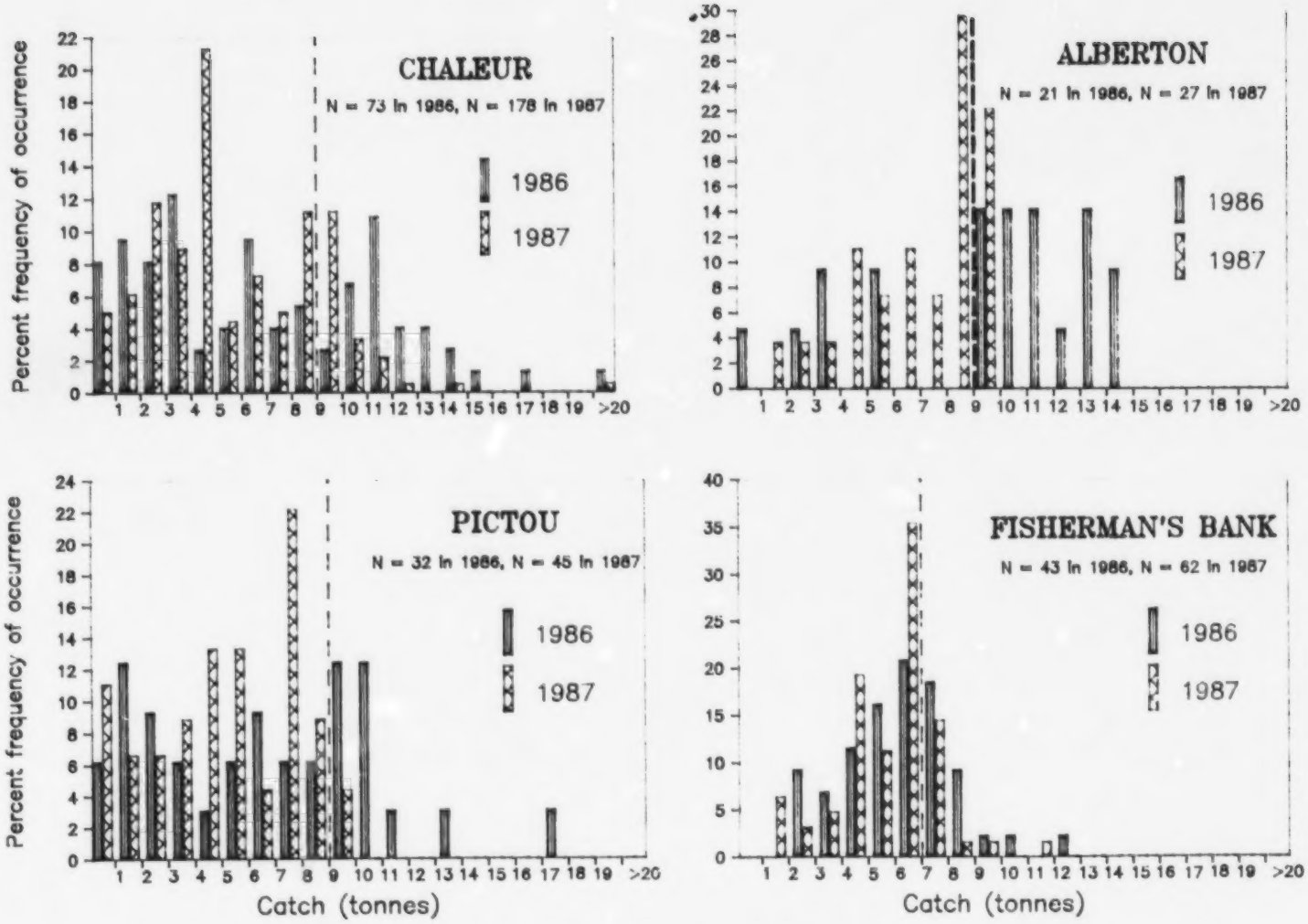

Fig. 11 Percent frequency distribution of nightly catches by index fishermen in the southern Gulf of St. Lawrence, fall 1986 and 1987.

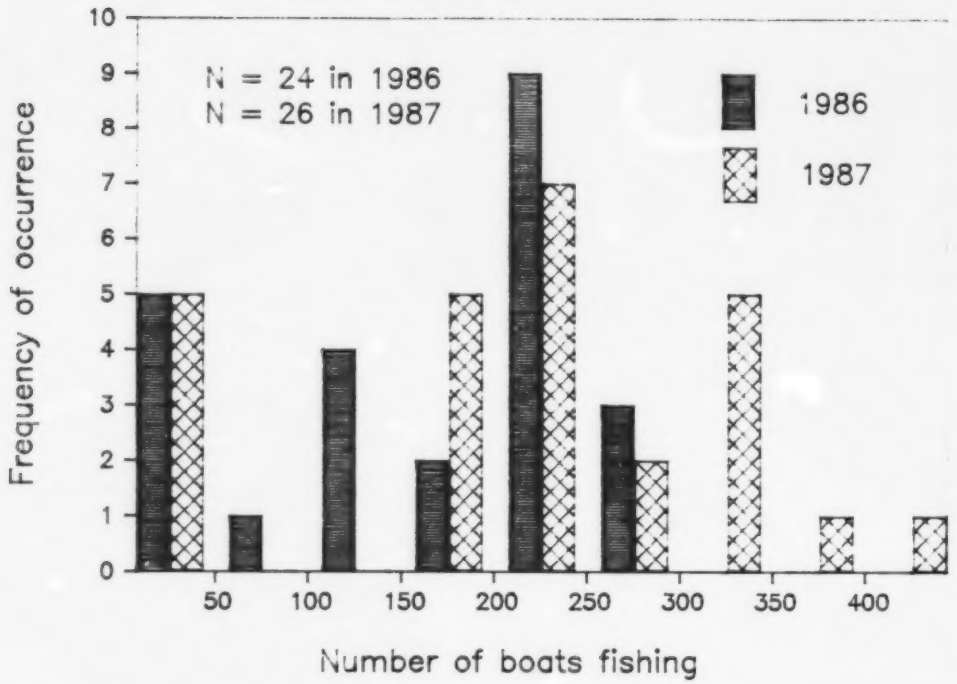

Fig. 12 **Frequency distribution of number of boats fishing per night in the fall herring fishery, Bay of Chaleur 1986 and 1987.**